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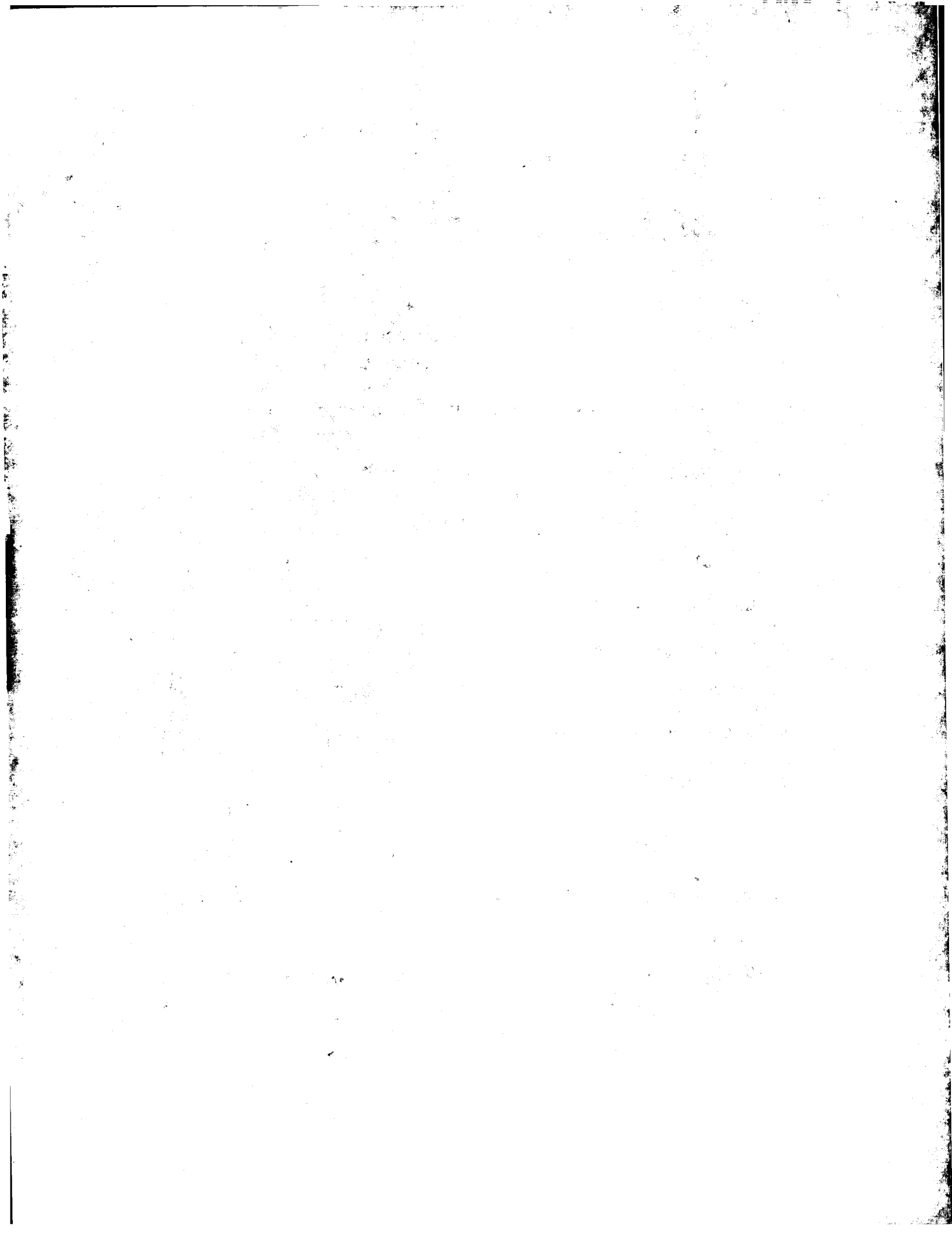
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>A61K 7/48, 7/06, C11D 3/37, 17/00, 3/20</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/59463</b> <b>(43) International Publication Date:</b> 12 October 2000 (12.10.00)
<b>(21) International Application Number:</b> PCT/EP00/02438 <b>(22) International Filing Date:</b> 20 March 2000 (20.03.00)  <b>(30) Priority Data:</b> 09/286,041 5 April 1999 (05.04.99) US  <b>(71) Applicant (for AE AU BB CA CY GB GD GH GM IE IL KE LC LK LS MN MW NZ SD SG SL SZ TT TZ UG ZA ZW only):</b> UNILEVER PLC [GB/GB]; Unilever House, Blackfriars, London EC4P 4BQ (GB).  <b>(71) Applicant (for all designated States except AE AU BB CA CY GB GD GH GM IE IL IN KE LC LK LS MN MW NZ SD SG SL SZ TT TZ UG ZA ZW):</b> UNILEVER NV [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL).  <b>(71) Applicant (for IN only):</b> HINDUSTAN LEVER LIMITED [IN/IN]; Hindustan Lever House, 165/166 Backbay Reclamation, Mumbai 400 020, Maharashtra (IN).  <b>(72) Inventor:</b> TSAUR, Liang, Sheng; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US).		<b>(74) Agent:</b> PEARCE, Timothy; Unilever PLC, Patent Department, Colworth House, Sharnbrook, Bedford, Bedfordshire MK44 1LQ (GB).  <b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> LIQUID COMPOSITIONS COMPRISING SKIN BENEFIT AGENT  <b>(57) Abstract</b> <p>A stable aqueous liquid comprising a surfactant, a dispersed cationic polymer particle and a small particle benefit agent. The dispersed polymer interacts with the benefit agent, without need of an additional structurant to stabilize particles in solution. Further, upon dilution, enhanced cationic deposition is achieved.</p>		

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## LIQUID COMPOSITIONS COMPRISING SKIN BENEFIT AGENT

5 FIELD OF THE INVENTION

The present invention relates to stable aqueous liquid  
cleansing compositions comprising small droplets of skin  
benefit agents and dispersed cationic polymer particles. In  
10 particular, the invention relates to aqueous liquid  
compositions in which small particle benefit agents are  
stably suspended and readily deposited upon dilution with  
water. Stability is accomplished through interaction of  
said small particle benefit agents and dispersed cationic  
15 polymers in said composition to form a microscopically  
visible, stable, benefit agent/polymer network. Upon  
dilution of said liquid compositions in water, the dispersed  
cationic polymers dissolve rapidly and interact with the  
small particles of benefit agent to achieve a high  
20 deposition of skin benefit agent.

BACKGROUND OF THE INVENTION

In addition to cleaning, another highly desirable  
25 characteristic of personal cleanser/shower gel type  
compositions is to deliver consumer perceivable skin  
benefits from the compositions to the skin. One important  
way of achieving this result is through a high deposition of  
emollient oils. In turn, this requires incorporation of  
30 high levels of oil into the cleanser/shower gel composition.

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Unfortunately, dual cleansing and moisturizing compositions are difficult to formulate because cleansing ingredients, in general, tend to be incompatible with moisturizing ingredients. For example, emulsified oil droplets, especially hydrocarbon oil droplets, tend to phase separate from liquids during storage and form a separate layer at the top of the liquid cleanser. Furthermore, without an efficient deposition mechanism, oil droplets contained in the cleansing composition can be washed off from the skin by surfactants during the use of the product preventing the high deposition needed for perceivable skin benefit.

Another problem is that emollient oils often tend to depress foaming/lathering of cleansing ingredients. Further, the best foaming cleansing surfactants also tend to be the least mild (i.e., they are irritating to the skin).

Accordingly, there is a need in the art for a composition which contains cleansing ingredients (which are both mild and capable of producing abundant lather) and which can also deliver moisturizing ingredients while remaining physically stable.

Liquid cleansers which can deliver skin benefit agents to provide some kind of skin benefit are known in the art. For example, one method of enhancing delivery of a benefit agent to the skin or hair is using prehydrated cationic polymers such as Polymer JR<sup>®</sup> from Amerchol or Jaguar<sup>®</sup> from Rhone Poulenc. This method is disclosed, for example, in U.S. Patent No. 3,580,853 to Parran et al, U.S. Patent 5,085,857

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to Reid et al., U.S. Patent 5,439,682 to Wivell et al; or in WO 94/03152 (assigned to Unilever), WO 92/18100 (assigned to Procter & Gamble) or WO 97/48378 (assigned to Procter & Gamble).

5

In the patents noted above, to achieve oil deposition or an skin conditioning effect the cationic polymers are premixed with an aqueous solution either in the presence of or in the absence of skin benefit agents to hydrate and dissolve the polymer before mixing with cleansing agents. Since they are dissolved, the cationic polymers are not visible even under a microscope. Dissolution of these cationic polymers in water is time consuming and costly, and can cause problems in processing, especially when a high level of cationic polymer is used in the composition in order to get high deposition of skin benefit agents. It is also known that liquid cleansing products containing a high level of pre-dissolved cationic polymer is not desirable due to lower lather speed and slimy feel. Processing difficulties and undesirable in-use properties tend to prevent the use of a high level of cationic polymer in the liquid cleanser to achieve high deposition of oils on to the skin.

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Further, the art teaches that physical stability of emollient oil cleanser systems requires the presence of some sort of suspending or stabilizing agent other than cationic agents. U.S. Patent No. 5,308,526 to Dias et al and U.S. Patent 5,439,682 to Wivell et al, for example, teach the use of crystalline ethylene glycol long chain esters (e.g., ethylene glycol distearate) as a suspension agent to prevent separation of oil droplets from the liquid. U.S. Patent No.

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5,518,647 to Zocchi teaches an emulsion system combining long chain ethoxylated alcohol, free fatty carboxylic acid and a water soluble polymer to achieve physical stability of oil droplets in liquid cleanser. Another type of well-known suspension agents used to stabilize oil droplets in liquid cleansers are high molecular weight water-soluble polymers such as polyacrylate, modified celluloses and guar polymers as disclosed, for example, in WO 96/02225 (assigned to Unilever). Although these materials are effective for suspending oil droplets, they are expensive ingredients and, as is the case with cationic polymers, at higher levels they tend to cause difficulty in processing and to impart an undesirable slimy feel during the use of the product.

Without imparting negative effects on important cleanser properties (such as lather and in-use sensory properties) and its processability, the applicants have found that storage stable liquid cleansers containing a high level of oils (e.g., from 1 to 30%, preferably from 3 to 30% by wt.) and a high level of cationic polymer (from 0.1 to 5%, preferably from 0.3 to 5% by wt.) can be formulated using cleanser insoluble, water soluble cationic polymer particles as a stabilizer. In this invention, cleanser stability is achieved by structuring the liquid with particles of skin benefit agents themselves without the need for conventional thickeners.

#### BRIEF DESCRIPTION OF THE INVENTION

The present invention relates to a composition comprising stable moisturizing liquid cleansers containing a high level



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of emollient oils (up to 30%); humectants; and dispersed cationic particles and to a process to prepare such liquids. It is known to be difficult to formulate liquids containing high level of hydrocarbon oils due to rapid separation of oils. In this invention, stability is achieved by structuring the liquids using particles of skin benefit agents themselves (interacting with a cationic polymer). Moreover, there is no need for conventional thickeners. As noted, a solid cationic polymer (at least 0.1 wt.%, preferably from 0.3 to 5 wt.%) is added to the liquid and exists in the liquid as dispersed particles to structure the oils in the liquids. Since no pre-hydration of cationic is needed in the process, a high level of polymer can be formulated in the liquid cleanser without imparting any process difficulty and undesirable in-use properties. This is important for achieving a higher deposition of the polymer when the liquids are later diluted.

As noted above, liquid stability is achieved through the interaction of dispersed cationic polymer particles (from 1 to 100 micrometers) and the small oil droplets (said oil droplets having a particle size in the range of from 0.1 to 10 micrometers). Upon dilution of the liquid composition with water, the dispersed cationic particles dissolve rapidly and interact with the small oil droplet to form large oil aggregates with a length greater than 50 micrometers. Enhanced deposition of the oil droplets onto the skin is achieved due to aggregate formation induced by the added cationic polymers. Liquid cleansers structured with this novel structuring system are stable at elevated temperature and provide good cleansing and skin conditioning

properties (by stable is meant there was no phase separation at 40° for at least 1 week or at room temperature for at least one month). A high level of cationic guar polymer can be formulated into the liquid to achieve high deposition for skin benefits without causing either undesirable in-use sensory properties or processing problems.

More specifically, the compositions of the invention comprise:

- (a) from 5 to 45% by wt., preferably from 5 to 35% by wt. of a surfactant selected from the group consisting of anionic surfactants, amphoteric surfactants, nonionic surfactants and mixtures thereof;
- (b) from 0.1 to 5.0% by wt., preferably from 0.3 to 5% by wt. of dispersed particles of a cationic polymer having a particle size of from about 1 to about 200 micrometers, preferably from about 2 to 100 micrometers;
- (c) from 1 to 30% by wt., preferably from 3 to 25% by wt. of a skin benefit agent emulsion having a particles size of from about 0.1 to about 10 micrometers, preferably from 0.1 to 5 micrometers; and
- (d) from 1 to 30% by wt., preferably 3 to 20% by wt. of water soluble skin benefit agents

wherein, upon dilution of the liquid composition with water, said dispersed cationic polymer dissolves and interacts with said skin benefit agent emulsion to form

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emulsion/polymer aggregates having a length greater than about 50 micrometers. These aggregates provide enhanced benefit agent deposition.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to stable aqueous liquid  
cleanser compositions comprising skin benefit agent  
5 emulsions and dispersed cationic polymer particles. The  
compositions may contain large amounts of cationic particles  
(since they are dispersed and not prehydrated). The  
compositions are stable and can deliver larger amounts of  
both benefit agent and cationic polymer. The dispersed  
10 cationic particles can be distinguished from prehydrated  
cationic in that they are visible as particles under a  
microscope while prehydrated cationic is not visible.

It is very difficult to make mild cleansing  
15 compositions which foam well, contain benefit agent  
emulsions and which are physically stable, particularly in  
the absence of stabilizers or suspending agents. It is also  
difficult to get a high deposition of a benefit agent from  
liquids.

20 Unexpectedly, the applicants have found that it is  
possible to make cleaning compositions comprising stable  
skin benefit agent emulsions by actually stabilizing the  
skin benefit agents (of relatively small size) with  
25 dispersed cationic polymer particles. While not wishing to  
be bound by theory, it is believed that a small size benefit  
agent emollient (i.e., about 0.1 to 10 micrometers) is  
stabilized in the cleansing composition due to its  
interaction with dispersed water-soluble cationic polymer  
30 ~~particle to form a network stable in the solution (this~~  
network is separate from the "aggregates" formed between

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benefit agent and polymer discussed below). Moreover, since this cationic need not be pre-dissolved, much more of it can be used than is normally the case, thereby allowing higher deposition upon dilution.

5

Further, the applicants have found that, upon dilution with water, the benefit agent emollient/oil and polymer interact to form aggregates, larger than about 50 micrometers, which readily deposit on skin or other  
10 substrate (plus, as noted, there is more cationic particles to begin with).

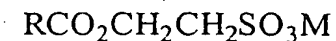
More specifically, the application is set forth in greater detail below:

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#### Surfactant

The surface-active agent can be selected from any known surfactant suitable for topical application to the human  
20 body. Mild surfactants, i.e., surfactants which do not damage the stratum corneum, the outer layer of skin, are particularly preferred.

One preferred anionic detergent is fatty acyl  
25 isethionate of formula:

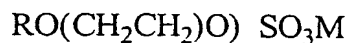


where R is an alkyl or alkenyl group of from 7 to 21  
~~carbon atoms and M is a solubilizing cation such as sodium,~~  
30 potassium, ammonium or substituted ammonium. Preferably at

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least three quarters of the RCO groups have from 12 to 18 carbon atoms and may be derived from coconut, palm or a coconut/palm blend.

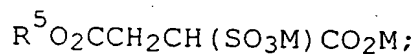
- 5 Another preferred anionic detergent is an alkyl ether sulphate of formula:



- 10 where R is an alkyl group of from 8 to 22 carbon atoms, n ranges from 0.5 to 10 especially from 1.5 to 8, and M is a solubilizing cation as before.

- Other possible anionic detergents include alkyl glyceryl ether sulphate, sulphosuccinates, taurates, 15 sarcosinates, sulphoacetates, alkyl phosphate, alkyl phosphate esters and acyl lactylate, alkyl glutamates and mixtures thereof.

- Suitable sulphosuccinates include monoalkyl 20 sulphosuccinates having the formula:



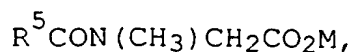
and amido-MEA sulphosuccinates of the formula:

- 25 
$$\text{R}^5 \text{CONHCH}_2\text{CH}_2\text{O}_2\text{CCH}_2\text{CH}(\text{SO}_3\text{M})\text{CO}_2\text{M};$$

wherein  $\text{R}^5$  is a C<sub>8</sub>-C<sub>20</sub> alkyl, preferably a C<sub>12</sub>-C<sub>15</sub> alkyl and M is a solubilizing cation.

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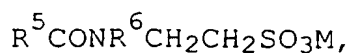
Suitable sarcosinates are generally of the formula:



5

wherein  $R^5$  is a  $\text{C}_8$ - $\text{C}_{20}$  alkyl, preferably a  $\text{C}_{12}$ - $\text{C}_{15}$  alkyl and M is a solubilizing cation.

10 Suitable taurates are generally identified by the formula:



15 wherein  $R^5$  is a  $\text{C}_8$ - $\text{C}_{20}$  alkyl, preferably a  $\text{C}_{12}$ - $\text{C}_{15}$  alkyl,  $R^6$  is a  $\text{C}_1$ - $\text{C}_4$  alkyl, and M is a solubilizing cation.

Harsh surfactants such as primary alkane sulphonate or alkyl benzene sulphonate are generally be avoided.

20 Suitable nonionic surface-active agents include alkyl polysaccharides, lactobionamides, ethylene glycol esters, glycerol monoethers, polyhydroxyamides (glucamade), primary and secondary alcohol ethoxylates, especially the  $\text{C}_8$ - $\text{C}_{20}$  aliphatic alcohols ethoxylated with an average of from 1 to  
25 20 moles of ethylene oxide per mole of alcohol.

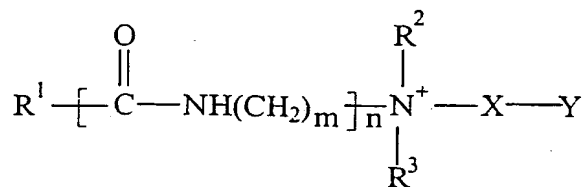
If the surface active agent comprises soap, the soap is preferably derived from materials with a  $\text{C}_8$  to  $\text{C}_{22}$

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substantially saturated carbon chain, preferably a potassium soap with a C<sub>12</sub> to C<sub>18</sub> carbon chain.

Mixtures of any of the foregoing surface active agents  
5 may also be used.

The surface active agent is preferably present at a level of from 5 to 35 wt.%, more preferably from 30 wt.%. It is also preferably that the composition includes from 3  
10 to 15 wt.% of a cosurfactant agent with skin-mildness benefits. Suitable materials are zwitterionic detergents that have an alkyl or alkenyl group having from 7 to 18 carbon atoms and comply with the overall structural formula:



15

where R<sup>1</sup> is alkyl or alkenyl having from 7 to 18 carbon atoms, R<sub>2</sub> and R<sub>3</sub> are each independently alkyl, hydroxyalkyl or carboxyalkyl having from 1 to 3 carbon atoms;  
m is from 2 to 4;

20 n is 0 or 1;

X is alkylene having from 1 to 3 carbon atoms, optionally substituted with hydroxyl; and

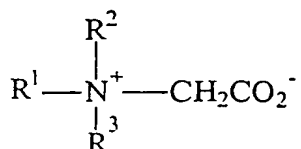
Y is -CO<sub>2</sub> or -SO<sub>3</sub>.

25

Zwitterionic detergents within the above general formula include simple betaines of formula:

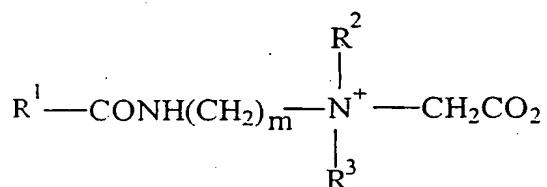


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and amido betaines of formula:

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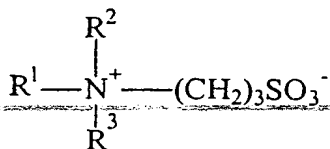
where m is 2 or 3.

10

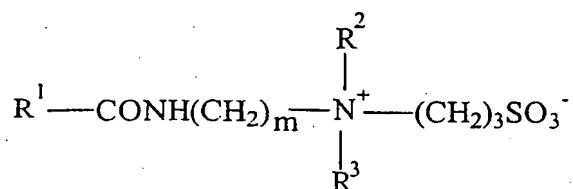
In both formulae  $\text{R}^1$ ,  $\text{R}^2$  and  $\text{R}^3$  are as defined previously.  $\text{R}^1$  may, in particular, be a mixture of  $\text{C}_{12}$  and  $\text{C}_{14}$  alkyl groups derived from coconut so that at least half, preferably at least three quarters, of the group  $\text{R}^1$  has 10 to 14 carbon atoms.  $\text{R}^2$  and  $\text{R}^3$  are preferably methyl.

15

Other suitable compounds include sulphobetaines of formula:

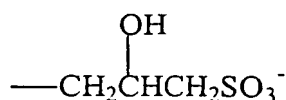


or



5

where m is 2 or 3, or variants of these in which  
---(CH<sub>2</sub>)<sub>3</sub>SO<sub>3</sub>--- is replaced by:



10

R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup> in these formulae are as defined  
previously.

15 In general, the total amount of surfactant is from  
about 5% to 45% of the compositions, preferably from 5 to  
35%.

#### Cationic Polymer

20

The compositions of the invention comprise from 0.1 to  
5.0%, preferably from 0.3 to 5%, more preferably from 1% to  
5% by wt. dispersed cationic polymer particles which both  
stabilize the skin benefit agents in the liquid cleanser (by  
25 forming a network between the emollient and dispersed

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cationic) and also works as deposition aid to deposit the skin benefit agents onto the skin during the use of the liquid cleanser (by forming aggregates between benefit agent and polymer). The cationic polymer may be a "standard" cationic polymer or an amphoteric polymer containing both cationic and anionic groups with net cationic charge.

The cationic polymer exists in the liquid cleanser as dispersed particles with a particle size of from 1 to 200 micrometers, preferably from 2 to 100 micrometers. These dispersed cationic polymer particles (by "dispersed" is meant that the particles can be seen as particles under a microscope) dissolve rapidly upon dilution of the liquid cleanser with water to induce aggregations of skin benefit agents (i.e., benefit agent plus cationic polymer aggregates) and achieve a high deposition onto the skin.

Cationic polymers suitable for this invention include solid water-soluble polymer particles that are insoluble in the cleanser. As noted, prehydrating or pre-dissolving the solid polymer particle in an aqueous solution before mixing it with the surfactant solution is unnecessary and not preferred. The cationic polymer is generally added into the liquid cleanser as a pre-dispersion. The polymer pre-dispersion is prepared by mixing the solid polymer with water mixable ingredients such as glycerol or propylene glycol. It can also be prepared by mixing the particles with low viscosity oils such as mineral oil, perfume or by mixing the polymer particle with an aqueous solution under such conditions that the polymer particles will not dissolve (for example, dispersing Jaguar Cl3S powder in an alkaline

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aqueous solution). Polymer pre-dispersion prepared by mixing with either water-soluble ingredients or with an aqueous solution is preferred. The pre-dispersion preferably has a viscosity of less than 100,000 centipoise, more preferably less than 10,000 centipoise, most preferable less than 1,000 centipoise. Thus it can be processed and mixed easily with the liquid cleanser.

Examples of cationic polymers suitable for use in the present invention are modified polysaccharides including cationic guar available from Rhone Poulenc under the trade name Jaguar C13S, Jaguar C14S, Jaguar C17, or Jaguar C16; cationic modified cellulose such as UCARE Polymer JR 30 or JR 40 from Amerchol; N-Hance 3000, N-Hance 3196, N-Hance GPX 215 or N-Hance GPX 196 from Hercules; cationic starches, e.g., StaLok<sup>(R)</sup> 100, 200, 300 and 400 made by Staley Inc.; and cationic galactomannans based on guar gum of Galactasol 800 series by Henkel, Inc.

As noted below, and without wishing to be bound by theory, it is believed that it is the "network" formed by interaction of the dispersed polymer particles and emulsion of benefits agents which is key to the physical stability of the liquid composition. Dispersed cationic polymer particle alone, as shown in Example 1, might not be physically stable by themselves in the liquid cleanser. Without a small oil droplet emulsion, these polymer particles precipitate to the bottom of the liquid composition during storage. With the addition of a small oil droplet emulsion, the dispersed cationic particles interact with the oil droplet to form a stable network so that they will not precipitate out of

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solution even without the aid of additional structurant. The dispersed cationics, when later diluted in use, interact with the benefit agent to form aggregates that enhance deposition.

5

#### Benefit Agent/Oil Droplet

The benefit agent is included in the composition to moisturize, condition and/or protect the skin. By "benefit agent" is meant a substance that softens the skin (stratum corneum) and keeps it soft by retarding the decrease in its water content and/or protects the skin.

Preferred benefit agents include:

15

- a) silicone oils, gums and modifications thereof such as linear and cyclic polydimethylsiloxanes, amino, alkyl alkylaryl and aryl silicone oils;
- 20 b) fats and oils including natural fats and oils such as jojoba, soybean, rice bran, avocado, almond, olive, sesame, persic, castor, coconut, mink oils; cacao fat, beef tallow, lard; hardened oils obtained by hydrogenating the aforementioned oils;
- 25 and synthetic mono, di and triglycerides such as myristic acid glyceride and 2-ethylhexanoic acid glyceride;
- c) waxes such as carnauba, spermaceti, beeswax,
- 30 lanolin and derivatives thereof;

- d) hydrophobic plant extracts;
- e) hydrocarbons such as liquid paraffins, petroleum  
jelly, microcrystalline wax, ceresin, squalene, and  
mineral oil;
- f) esters such as cetyl octanoate, myristyl lactate,  
cetyl lactate, isopropyl myristate, myristyl  
myristate, isopropyl palmitate, isopropyl adipate,  
butyl stearate, decyl oleate, cholesterol  
isostearate, glycerol monostearate, glycerol  
distearate, glycerol tristearate, alkyl lactate for  
example lauryl lactate, alkyl citrate and alkyl  
tartrate;
- g) essential oils such as fish oils, mentha, jasmine,  
camphor, white cedar, bitter orange peel, ryu,  
turpentine, cinnamon, bergamont, citrus unshiu,  
calamus, pine, lavender, bay, clove, hiba,  
eucalyptus, lemon, starflower, thyme, peppermint,  
rose, sage, menthol, cineole, eugenol, citral,  
citronelle, borneol, linalool, geraniol, evening  
primrose, camphor, thymol, spirantol, pinene,  
limonene and terpenoid oils;
- h) lipids such as cholesterol, ceramides, sucrose  
esters and pseudo-ceramides as described in  
European Patent Specification No. 556,957;
- ~~i) vitamins such as A and E, and vitamin alkyl esters,  
including those vitamin C alkyl esters;~~

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j) sunscreens such as octyl methoxyl cinnamate (Parsol MCX) and butyl methoxy benzoylmethane (Parsol 1789);

5

k) Phospholipids; and

l) mixtures of any of the foregoing components.

10

Where adverse interactions between the benefit agent and surface active are likely to be particularly acute, the benefit agent may be incorporated in the compositions of the invention in a carrier.

15

Such benefit agents include lipids; alkyl lactates; esters such as isopropyl palmitate and isopropyl myristate; sunscreens; and vitamins. The carrier can, for example, be a silicone or hydrocarbon oil which is not solubilized/micellized by the surface active phase and in

20

which the benefit agent is relatively soluble.

Particularly preferred benefit agents include petrolatum, silicone oils, triglyceride oils and modification thereof; esters such as isopropyl palmitate and

25

myristate and alkyl lactates.

The benefit agent is preferably present in amount of from 1 to 30 wt.%, preferably from 3 to 25 wt.%.

- 20 -

The benefit agent droplets/emulsion of the invention typically have a particle size of from about 0.1 to 10 micrometers, preferably from 0.1 to 5 micrometers.

5 While not wishing to be bound by theory, it is believed the dispersed cationic polymer particle interacts with skin benefit agent to form an emulsion/polymer network. Stability of small droplet emulsion and dispersed polymer particle is achieved due to the formation of these  
10 emulsion/polymer networks.

By structuring a benefit agent with cationic polymers, use of any other structurant can be minimized or avoided altogether.

15

#### Water Soluble Benefit Agents

Another essential ingredient that is preferred to be included in the liquid composition is a water-soluble skin  
20 benefit agent. A variety of water-soluble skin benefit agents can be used. They are typically used in an amount of from 1 to 30 weight %, preferably from 1 to 20% by wt. The skin conditioning effect of deposited oils can be enhanced by addition of these water-soluble skin benefit agents. The  
25 water soluble benefit agent, as described above, can also work as a processing aid for the addition of solid cationic polymer particles. The materials include, but are not limited to, polyhydroxy alcohols such as glycerol, propylene glycol, sorbitol, pantenol and sugar; urea, alpha-hydroxy  
~~30 acid and its salt such as glycolic or lactic acid; and low~~  
molecular weight polyethylene glycols with a molecular



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weight of less than 20,000. Preferred water soluble skin benefit agents for use in the liquid composition are glycerol, sorbitol and propylene glycol.

5 In a second embodiment, the invention provides a process for enhancing deposition of small particle oil/emollient droplets (from 0.1 to 10 micrometers, preferably from 0.1 to 5 micrometers, more preferably from 0.1 to 3 micrometers) by first combining oil droplets with  
10 cationic polymers as discussed above in an aqueous surfactant solution and subsequently diluting the compositions in water upon use. Upon dilution with water, the dispersed cationic polymer particles dissolve and induce "aggregates" of small oil droplets having particle size with  
15 length greater than 50 micrometers. These aggregates are different from the networks formed before dilution.

The present invention is set forth in greater detail in the Examples that follow. The Examples are for illustration  
20 purposes only and are not intended to be limiting in any way.

All percentages in the Examples and specification, unless indicated otherwise, are intended to be percentages  
25 by weight.

All numerical values and ranges in the specification are intended to be modified by the word "about".

~~30~~ Finally, the term comprising, where used in the specification or claims, is intended to specify the presence

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of stated features, integers, steps, components, but not to preclude the presence of addition of one or more features, integers, steps, components or groups thereof.

## 5 EXAMPLES

### Example 1

The following Example shows that dispersed cationic guar particles alone can work as an effective stabilizer for oil droplets in surfactant solution. Without the need of other structuring agents, stable moisturizing liquid can be prepared using a combination of dispersed cationic guar particles and a small droplet emulsion of skin benefit agents. Three samples with compositions shown in the Table below were prepared. Example 1 is an example of this invention. Examples A and B were prepared for comparison. All the surfactants, NaOH solution and deionized water were added to a conventional mixer and mixed at from 70°C to 75°C for about 30 minutes to form a uniform solution. A silicone emulsion and a sunflower oil emulsion were then added to the surfactant solution and mixed at from 55°C to 60°C for about 10 to 20 minutes. Jaguar C13S was mixed with glycerine to form guar powder dispersion. The dispersion was then added into the mixer and mixed for from 20 to 30 minutes. The mixer was then cooled to around 35°C. Perfume and glydant plus were added and mixed for about 20 minutes. The prepared liquids were cooled and discharged from the mixer.

- 23 -

The stability of these three liquids was compared by storing the samples in 40°C oven for one week. The result is also shown in the Table below. Example 1, an example of this invention containing both oil emulsions and dispersed cationic guar particles, was stable after storage. Comparative Examples A and B, containing either the dispersed guar particle or the oil emulsions alone, were not stable. A creamy layer of oils floated to the top for Comparative A and a layer of polymer gel particles precipitated at the bottom of Comparative B.

	Example 1	Comparative A	Comparative B
Na Cocamidopropyl Betaine	8.0	8.0	8.0
Na Laureth (3) Sulfate	2.0	2.0	2.0
Na Cocoisethionate	5.0	5.0	5.0
Silicone oil emulsion (50%)	15	15	0.0
Sunflower oil emulsion (50%)	15	15	0.0
NaOH (50%)	0.1	0.1	0.1
Cationic guar (Jaguar C13S)	1.2	0.0	1.2
Glycerine	5.0	5.0	5.0
Glydant Plus	0.2	0.2	0.2
Perfume	1.0	1.0	1.0
Water	To 100 wt.%	To 100 wt.%	To 100 wt.%
Stability (1 week storage at 40°C)			
	Stable	Phase separate Cream to the top	Phase separate Precipitate

### Example 2

Another Comparative Example, with a composition the same as Example 1, was prepared to show the advantages method of this invention over the preferred method taught in

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the prior art. Instead of adding the cationic guar as dispersed particles into the surfactant mixture (as per the present invention), the cationic guar was first prehydrated in aqueous solution before being mixed with the surfactant mixture (as is taught in the prior art). All the surfactants (Cocamidopropyl betaine, laureth sulfate and cocoisethionate), NaOH and a calculated amount of water were mixed at from 70°C to 75°C to form surfactant premix with 30% solid. Jaguar Cl3S was mixed with the remaining water, a silicone emulsion, a sunflower oil emulsion and glycerol in the mixer at 70°C for about 30 minutes to prehydrate the cationic guar. The surfactant premix was then added into the reactor and mixed for about 30 minutes at 60°C. The reactor was cooled to 35°C. Perfume and glydant plus were added. It was noticed that there were polymer gels coated the stirrer and large lumps of polymer gels were contained in the prepared liquid. The liquid was not stable and showed phase separation after being stored at 40°C for 1 week.

This Example demonstrates that the procedure of this invention (using dispersed particles rather than prehydrating) provides a better way to process liquid containing high level of cationic guar polymers. It also shows that better stability was achieved using the suspended guar particle as emulsion stabilizer instead of using fully hydrated cationic guar polymers which are preferred in the prior art.

~~30-Examples 3-4: Deposition of Skin Benefit Agent~~

- 25 -

This Example shows that a high deposition of skin benefit agent can be achieved without prehydrating the cationic polymer before mixing it with a surfactant solution. Deposition efficiency depends on the dissolution of the suspended cationic guar particles upon dilution of the liquid with water. To achieve high deposition, the suspended cationic guar particles have to dissolve rapidly during use of the liquids to interact with and to deposit the oil emulsions onto the skin.

	Example 3	Example 4	Comparative C
Na Cocamidopropyl Betaine	10.0	10.0	10.0
Na Laureth (3) Sulfate	2.0	2.0	2.0
Na Cocoisethionate	3.0	3.0	3.0
Silicone oil emulsion (50%)	20	20.0	20.0
NaOH (50%)	0.1	0.1	0.1
(Jaguar C13S)*	0.6	-	-
Miracare XC96/21**	-	0.6	-
Miracare XC 96/25**	-	-	0.6
Glycerine	2.0	2.0	2.0
Antil 141***	1.0	1.0	1.0
Glydant Plus	0.2	0.2	0.2
Perfume	1.0	1.0	1.0
Water	To 100 wt. %	To 100 wt. %	To 100 wt. %
Stability (1 week storage at 40°C)			
	Stable	Stable	Stable

\* Cationic guar from Rhone-Poulenc

\*\* Amphoteric guar from Rhone-Poulenc with net cationic charge

15 \*\*\* Polyethylene propylene glycol oleate

All the above three samples contain dispersed guar particles as observed under optical microscope. Upon dilution of the liquid with water, the dispersed guar particles dissolve rapidly for both Examples 3 and 4. For

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Comparative Example C, most of the guar particles remain intact after diluting the liquid with water. Deposition of the above three samples on adult porcine skin purchased from Buckshire was measured using the following method.

5

Porcine skin of 3 x 3 square inches was prewetted with tap water. 0.52 grams of the liquid were placed on the skin and rubbed on the skin for 15 seconds. The skin was then rinsed under tap water at a flow rate about 13 cc per minute for 15 seconds. After rinsing the skin was patted dry with paper towel once and air dried for 2 minutes. The deposited silicone oil was then extracted with known amount of xylene. The silicone content in the xylene extract was analyzed using inductively coupled argon plasma atomic emission technique (Thermo Jarrell Ash AtomScan-25 inductively coupled plasma spectrophotometer). The deposition of these three samples is summarized in the following Table. It clearly shows that liquids (Examples 3 & 4) containing the composition as described in this invention deposit significantly higher amount of skin benefit agents than Comparative Example C which do not contain the type of cationic solid polymer suitable for the use in this invention.

25

	Example 3	Example 4	Comparative C
Silicone Deposition (micrograms/cm <sup>2</sup> )	41.5	43.5	3.82

#### Example 5: Effect of Cationic Guar Level on Stability

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	Comparative D	Example 5	Example 6
Na Cocamidopropyl Betaine	10	10	7.0
Na Laureth (3) Sulfate	2.0	2.0	3.5
Na Cocoisethionate	3.0	3.0	4.5
Silicone oil emulsion (50%)	15	15	15
Sunflower oil emulsion (50%)	15	15	15
NaOH (50%)	0.1	0.1	0.1
Cationic guar (Jaguar C13S)	0.7	2.0	0.7
Glycerine	3.5	6.0	3.5
Glydant Plus (Preservative)	0.2	0.2	0.2
Antil 141	1.0	0.0	0.0
Perfume	1.0	1.0	1.0
Water	To 100 wt. %	To 100 wt. %	To 100 wt. %
Stability at 40°C for 1 week			
	Not stable	Stable	Stable

The above liquids were prepared using the same  
 5 procedure described in Example 1. These samples contained  
 different surfactant mixtures and different levels of  
 cationic guar dispersion. Comparative Example D was not  
 stable after storage. Examples 5 and 6 were stable at 40°C.  
 This Example shows that stability of liquids depends on the  
 10 surfactant composition and the level of cationic polymer  
 used in the composition. For example, it can be seen that  
 0.7 cationic was sufficient to stabilize composition 6  
 containing only 7.0% betaine but did not stabilize  
 composition D containing 10% betaine. Addition of more  
 15 cationic (Example 5) or decreasing betaine (Example 6)  
 helped stabilize the compositions.

## Examples 7-9 and Comparatives Examples E and F

	Example 7	Example 8	Example 9	Comparative E	Comparative F
Na Cocamidopropyl Betaine	10	10	10	10	10
Na Laureth (3) Sulfate	2.0	2.0	2.0	2.0	2.0
Na Cocoisethionate	3.0	3.0	3.0	3.0	3.0
Silicone oil emulsion (50%)	15	15	15	15	15
Sunflower oil emulsion (50%)	15	15	15	15	15
NaOH (50%)	0.1	0.1	0.1	0.1	0.1
Cationic guar (Jaguar C13S)	2.0	-	-	-	-
Cationic guar (Polymer JR)	-	2.0	-	-	-
Cationic guar (N- Hance 3215)	-	-	2.0	-	-
Merquart 100	-	-	-	2.0	-
Merquart 550	-	-	-	-	2.0
Glycerine	2.5	2.5	6.0	3.5	3.5
Glydant Plus	0.2	0.2	0.2	0.2	0.2
Antil 141	1.0	1.0	0.0	0.0	0.0
Perfume	1.0	1.0	1.0	1.0	1.0
Water	To 100 wt. %	To 100 wt. %	To 100 wt. %	To 100 Wt. %	To 100 wt. %

5

The Example above shows effect of cationic polymer type on liquid stability. Jaguar C13S, Polymer JR and N-Hance are solid cationic guar polymers (stability obtained) and Merquart 100 and Merquart 550 are presolubilized aqueous polymer solution (no stability obtained).

10

The above liquids were prepared using the procedure described in Example 1 except in Comparatives Examples E and F the cationic polymer, i.e., Merquart 100 and Merquart 550, was added without premix with glycerol. Glycerol for Comparative Example E and F were added after adding the

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cationic polymer. Examples 7, 8 and 9 were stable at 40°C for 1 week. Comparative Samples E and F were not stable with a clear layer formed at the bottom of the samples.

## 5 Examples 10-13

These Examples show that this invention is suitable for a variety of oils and surfactant mixture. All the samples prepared according to the method described in Example 1 were stable after 1 week, 40°C storage.

	Example 10	Example 11	Example 12	Example 13
Na Cocamidopropyl Betaine	7	5	5	10
Na Laureth (3) Sulfate	3.5	-	-	5
Na Cocoisethionate	4.5	-	-	0
Lauryl Polyglucoside	-	3	-	-
Na Laurylamphoacetate	-	7	-	-
Cocoamido 3EO sulfate	-	-	10	-
Petrolatum emulsion (50%)	34	44	24	-
Silicone oil emulsion (50%)	6	6	6	-
Sunscreen/sunflower oil emulsion* (50%)	-	-	-	30
Cationic guar (Jaguar C13S)	1.5	2.0	1.6	1.8
Glycerine	5.0	6.0	5.0	6.0
Glydant Plus	0.2	0.2	0.2	0.2
Perfume	1.0	1.0	1.0	1.0
Water	To 100 wt. %	To 100 wt. %	To 100 wt. %	To 100 wt. %

\* The emulsion contains 20% Parsol MCX (sunscreen) and 80% of sunflower oil which was prepared by homogenized 50 wt.% of Parsol MCX and sunflower oil mixture in 50 wt.% of aqueous solution containing 3 wt.% of sodium cocamidopropylbetaine and 2 wt.% of sodium laureth sulfate.

CLAIMS

1. An aqueous liquid composition comprising:

5

(a) from 5 to 45% by wt. of a surfactant selected from the group consisting of anionic surfactants, amphoteric surfactants, nonionic surfactants and mixtures thereof;

10

(b) from 0.1 to 5.0% by wt. of dispersed cationic polymer particles having a particle size of from about 1 to about 200 micrometers;

15

(c) from 1 to 30% by wt. of a skin benefit agent emulsion having a particles size of from about 0.1 to about 10 micrometers;

(d) from 1 to 30% by wt. of a water soluble skin benefit agent;

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wherein upon dilution of the liquid composition with water, said dispersed cationic polymer particles (b) dissolve and interact with said skin benefit agent emulsion (c) to form emulsion/polymer aggregates having a length of greater than about 50 micrometers.

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2. A composition according to claim 1 comprising from 5 to 35% by wt. of surfactant.

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3. A composition according to claim 1 or 2, wherein the cationic polymer is an amphoteric polymer containing a cationic group and an anionic group and having a net cationic charge.

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4. A composition according to any one of the preceding claims, wherein the cationic polymer is added to the composition as a pre-dispersion which has been prepared by  
5 mixing a solid cationic polymer with water soluble ingredients, low viscosity oils, or an aqueous solution under conditions such that the polymer particles will not dissolve.
- 10 5. A composition according to claim 4, wherein said pre-dispersion has a viscosity of less than 100,000 centipoise.
6. A composition according to any one of the preceding claims, wherein the cationic polymer has a particle size of  
15 from 1 to 100 micrometer.
7. A composition according to any one of the preceding claims, wherein the skin benefit agent of emulsion (c) has a particle size of from 0.1 to 5 micrometers.
- 20 8. A composition according to any one of the preceding claims comprising from 0.3 to 5% by wt. of cationic polymer.
9. A composition according to any one of the preceding  
25 claims, comprising from 3 to 25% by wt. of the composition of the benefit agent emulsion (c).
10. A composition according to any one of the preceding claims, comprising substantially no structurants.

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11. A composition according to any one of the preceding claims, wherein said water soluble benefit agent (d) is a polyhydroxy alcohol.

5 12. A composition according to claim 11, wherein said alcohol is selected from the group consisting of glycerol, sorbitol and polyalkylene glycol.

10 13. A composition according to any one of the preceding claims, comprising from 3 to 20% by wt. of a water soluble skin benefit agent.

14. A process for enhancing deposition of oil/emollient droplets having a particle size of from 0.1 to 10  
15 micrometers, which process comprises:  
    (a) combining said oil droplets with a dispersed cationic polymer in an aqueous solution to form a dispersed oil and a dispersed cationic polymer in an aqueous surfactant solution; and  
20      (b) diluting said aqueous surfactant solution such that the dispersed cationic polymer particles dissolve and induce formation of cationic polymer/oil aggregates having a length of greater than 50 micrometers.

25

# INTERNATIONAL SEARCH REPORT

Inter. nal Application No

PCT/EP 00/02438

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61K7/48 A61K7/06 C11D3/37 C11D17/00 C11D3/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61K C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 96 17592 A (PROCTER & GAMBLE) 13 June 1996 (1996-06-13) page 4, line 25 -page 5, line 19 page 6, line 26 -page 8, line 6 page 15, line 20 -page 16, line 21 page 17, line 23-25 examples ---	1,2,4, 6-14 3
A	US 5 085 857 A (REID EUAN S ET AL) 4 February 1992 (1992-02-04) cited in the application column 5, paragraph 1 examples 4,5 ---	1-3, 7-12,14
A	WO 97 49376 A (RHONE POULENC CHIMIE) 31 December 1997 (1997-12-31) the whole document ---	1-5,8, 10-13
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search

26 May 2000

Date of mailing of the international search report

19/06/2000

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## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 00/02438

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, A	<p>WO 99 25313 A (HERCULES INC)  27 May 1999 (1999-05-27)  page 3, line 21 -page 4, line 14  page 6, line 5 -page 7, line 20  examples</p> <p>-----</p>	<p>1-5, 8,  10-12</p>

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information on patent family members

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